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ABSTRACT

Nationally many middle-level schools are changing from a traditional junior high school structure (grades 7-9) to middle schools (grades 6-8). A case study examined the impact of middle school organizational changes that occurred as a large North Carolina school system converted from junior high schools to middle schools on science teachers and science instruction. A qualitative case study methodology utilized structured interviews of 14 teachers from 3 schools to determine the time allocated for science instruction, the science content of interdisciplinary units, science equipment transfer and storage, pre- and in-service science education of teachers, and science leadership issues. A recurring theme that emerged from the study was the unique situation of the sixth grade science teacher. Seventh and eighth grade teachers in the study did not perceive sixth grade science teaching as "equivalent" to their own; the sixth grade teachers had a feeling of low status in that their equipment and supplies were not equal to that of the seventh and eighth grade teachers. Because of the differences in preservice teacher education of elementary and secondary teachers, it is suggested that the sixth grade teachers receive additional science inservice training and that the seventh and eighth grade teachers receive additional inservice education on interdisciplinary instruction and child development. The study found: that science instruction was enhanced under the new organizational structure; teachers had more instructional time; and teachers were supportive about the middle school organization. (KR)

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THE IMPACT OF TRANSITION FROM JUNIOR HIGHS TO MIDDLE SCHOOLS ON SCIENCE PROGRAMS

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Paper presented at the annual meeting of the National Association for Research in Science Teaching, April 7-10, 1991, Lake Geneva, Wisconsin.

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The Impact of Transition From Junior Highs to Middle Schools on Science Programs

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Introduction

This research was an exploratory study examining how organizational changes that occurred as a large North Carolina school system converted from a junior high to a middle school organization influenced middle-level science teachers and science instruction.

There is a nation-wide educational movement from a junior high system of early adolescent education to middle school organization. In 1987, there were 47% more middle schools in the United States with grades 6-8 (N=1,137) than in 1971 (N=772) (Alexander & McEwin, 1989). Making the move from a junior high to a middle school organization usually involves moving sixth grade teachers and students from the elementary school to the middle school and moving the ninth grade teachers and students from the junior high school to the high school. The reorganization and reassignment of over sixteen percent of the faculty and students in a system is a considerable change that impacts not only on the middle schools but also dramatically alters the elementary and high school populations (George, 1990). The middle-level organizational changes have been very costly for school systems, and there is little research that documents the change process or influence of this new school structure on classroom instruction.

The reorganization of middle-level schools reflects not only a change in grade configuration but middle schools typically adopt a distinctly different philosophy and intragrade structure. Usually schools are organized into interdisciplinary teacher teams and they structure time for team planning, teaching, evaluation and interdisciplinary instruction. Within this teaming structure is a de-emphasis on departmental organization and the replacement of subject area department chairs with interdisciplinary team leaders (Alexander & George, 1981).

Another component of middle schools is a program of guidance (advisor/advisee) which ensures that each student is well known by at least one faculty member. These programs focus on social skill development, values clarification, record keeping, field trips, career exploration and opportunities for students to socialize through games and sports. Often advisor-advisee programs meet three to five times a week.

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Middle schools also utilize block scheduling and other time arrangements to facilitate flexible and efficient use of time. According to Alexander and George (1981) flexible scheduling allows teachers in teams to influence the schedule to "avoid the necessity of giving 'equal time to unequal subjects.' Within the acceptable options for middle school scheduling, all give teachers on the team the opportunity to make judgments about how much time should be given to each of the subjects under their jurisdiction, considering the characteristics of students in their charge" (Alexander & George, 1981).

Historically, junior high school teachers held the same certification (secondary education, grades 7-12) and completed the same teacher education programs as high school teachers. But with the growing middle school movement, many institutions of higher education are now offering some type of middle school teacher preparation program and certification (McEwin & Alexander, 1988). However, the switch to middle school organization means that sixth grade teachers, who were broadly certified and taught in elementary schools, now teach science, for example, for half or more of their day in middle schools next to seventh and eighth grade science teachers who graduated with degrees in chemistry, physics or biology. Middle school certification (grades 6-9) became available in North Carolina in 1984 and by 1987, middle school certification or endorsement was available in 28 states.

The middle school movement has not been without its critics. Science curriculum supervisors and principals frequently turn to middle school advocates with concerns about potential loss of quality in the science instructional program as the focus shifts with middle schools from departmentalized content areas to developmental needs of students. This study explores some of the concerns of content area specialists with middle school transition in one school system.

Research Questions

This case study was undertaken from a science specialist perspective to examine how the organizational change from a junior high to a middle school influenced the science instructional program. The following guiding questions and assumptions were formulated to direct the data collection as described by Lutz and Ramsey (1974):

A. Are there differences in the pre- and inservice education of sixth, seventh and eighth grade teachers? (Assumption: sixth grade teachers would have had considerably less preparation in science, may lack certification in science and these differences could create subtle problems for sixth grade teachers.)

B. Is there less time devoted to the teaching of science under the middle school structure? (Assumption: with the addition of teaming, team planning time and advisor/advisee programs, the amount of time available for science instruction would be less than was available under a junior high organization.)

C. How much science is involved in interdisciplinary units taught by teams? (Assumption: the interdisciplinary units designed by teachers would emphasize reading and writing and little of the interdisciplinary unit would involve science instruction.)

D. What happens to science equipment in the transition from a junior high to a middle school? (Assumption: sixth grade teachers would lack needed equipment and supplies and "ownership" problems might exist.)

E. How is science-related information shared? (Assumption: with the de-emphasis on science departments and science department chairs, teachers might not be getting information about science competitions, science organizations and inservice opportunities.)

Research Methodology

It was decided that the research questions could best be answered by the use of a qualitative case study methodology involving ethnographic semi-structured interviews of middle school science teachers. Each interview took place at the school site and lasted about one hour; field notes and audiotapes were made. All tapes were transcribed and triangulation was sought through the use of field notes, transcripts and data collected from personnel records and written background surveys. The researchers addressed validity by checking for representativeness, examining conclusions for researcher effects and making contrasts and comparisons within and among the data as described by Smith (1987).

A large North Carolina school system was selected for the study. The study was conducted when the school system had completed its first year of reorganizing into middle schools. The school system took two years of planning and preparation before making the transition. Of the six junior high schools in the system, only three were fully converted to middle schools with a 6-8 grade configuration, interdisciplinary team organization, flexible block scheduling and intramural sports. Two of the original 7-9 junior high schools maintained their grade configurations, due to space limitations at the high schools. Only the three middle schools with grades 6-8 were included in the study.

Before making the transition, a task force of over 50 individuals within the school community worked in various capacities to frame the philosophy

and guidelines for the emerging middle school program. From that framework, staff development was planned and implemented at the central office and school levels. All teachers moving into the middle schools received a theoretical overview of the middle school concept, including characteristics of the early adolescent with implications for instruction, interdisciplinary team organization, and teacher-based guidance. Follow-up training included "how-to" sessions on teaming, advisor/advisee programs, as well as visitations to middle schools in other systems and middle school conferences. School-based planning occurred as teachers worked in teams within their schools to design specific program components such as the number of teachers per team, the team leader selection process and the team "house" configuration.

Population

Three middle schools were selected to participate in the study. School A was an upper-middle class suburban school that had just moved into a new building designed to accommodate different houses and interdisciplinary teams together. School B was an older, historically rural school that had become urban middle class due to recent development in the area. School C was a rural, middle class school.

All science teachers in the three schools were contacted and asked to volunteer to participate in a study examining what happens to science instruction in the transition from a junior high school structure to a middle school. Fourteen teachers volunteered to participate in the study, three male and eleven female. Four of the teachers taught sixth grade, five taught seventh grade and five taught eighth grade.

Results

Teacher Preparation

Teachers in the study had a wide variety of teaching experience and educational backgrounds. Sixth grade teachers had the fewest years teaching experience, had completed the fewest science courses (X=7.75) and held no graduate degrees, but they had completed nearly five times as many science inservice workshops (Table 1). All of the sixth grade teachers had completed a teacher education program leading to elementary or intermediate certification (Table II). All of the teachers held either science certification or science endorsement (18 hours of science coursework). The results of this study are consistent with the results of a national survey conducted by McPartland (1990) which showed that schools serving grades 8 and 9 typically are staffed by teachers with subject matter expertise. There is additional evidence that certification in science may increase student achievement. Data from the 1985-86 National Assessment of Educational Progress indicated that

seventh-graders who were taught by specialized subject matter experts showed higher achievement in science than did seventh-graders taught by less specialized teachers (McPartland, 1990).

Although the teachers in the present study held science certification or endorsement, their preparation for teaching early adolescents was not as clear. Teachers ranged from holding a kindergarten through eighth grade certificate to a high school certificate (grades 9-12). These data clearly reflect the changes that have occurred nationally in middle school organization and teacher certification. Nearly half of the teachers were originally prepared as elementary or secondary teachers. This is also consistent with the findings of McPartland (1990), that there is a dearth of teachers prepared specifically for middle-grade instruction.

Time Allocated for Science Instruction

This study also examined the amount of time allotted for teaching science. The case study schools added advisor/advisee programs and team planning time as part of the middle school reorganization, and the researchers were interested in determining if the addition of these middle school components reduced the amount of time available for teaching science. The interviews with the teachers revealed that the amount of time for science instruction actually increased. Under the junior high structure, daily science periods were 45-48 minutes long, depending on the school. With the implementation of the middle school schedules, science periods became 58-60 minutes long. Although two teachers did report that their science periods were only 40 and 50 minutes long and indicated that they would like to see the time for science instruction increased, the rest of the teachers interviewed actually had more time to teach science after the conversion to the middle school schedule.

Interdisciplinary Instruction

The teachers interviewed were asked to discuss their plans and presentations for interdisciplinary units. The researchers were interested in the amount of science taught in interdisciplinary units. The science teachers in this study all had a full team planning period daily with three other teachers (language arts, social studies, and mathematics). This allowed time for planning and implementing units that crossed all disciplines. All teachers except one reported planning and presenting an interdisciplinary unit lasting from 2-4 weeks of instructional time. A list of the interdisciplinary topics taught appears in Table III.

Most of the units were primarily science-oriented, including such topics as: "Flight," "The Zoo," and "Conservation." Therefore, the assumption that interdisciplinary units would involve little science instruction did not prove to be the result as seen by the science teachers. In fact, the apparent interdisciplinary orientation of the units seemed to

enhance the total science program. When asked about integrating the curriculum, one eighth grade teacher reported:

> I've always tried to incorporate or think of the idea that any course that I teach, whether it's math or science or social studies, that you don't walk out the door and it stops there, or that it's always in a classroom. The kids were amazed when all of a sudden I've used something on the board and they said "Oh, that's math class." I said, "Yea, that's science class too."

Science Equipment

Several interesting trends emerged from the interviews with the teachers. Nearly all the teachers indicated that most or all of the physical science equipment was taken by the ninth grade teachers to the high school. Several of the teachers felt that the ninth grade teachers had taken materials that should have been left in the middle school. All of the teachers interviewed thought that the sixth grade teachers brought very few or no supplies and equipment with them from the elementary school. There was also an underlying attitude that sixth grade teachers did not need any equipment or supplies to teach science. For example one sixth grade teacher stated:

> I was told at the beginning of the year ... by my principal... that sixth grade teachers don't do experimentation. And I figured: maybe that is why science is such a poor thing in North Carolina. People are coming in from other places and taking our jobs (in technical areas). These children need to be doing experimentation since about first grade.

Another teacher said: "The sixth grade (teachers) use mainly rulers and things like that." It was apparent that in the turmoil of making the transition, the supply and equipment needs of the incoming sixth grade teachers had not been a high priority. Seventy percent of the seventh and eighth grade teachers felt they had most of the supplies and equipment they needed; however, sixty-six percent of the sixth grade teachers expressed a great need for science equipment and supplies. In addition, all but one of the seventh and eighth grade teachers felt they had good access to equipment but all of the sixth grade teachers indicated they had no or very poor equipment access. The seventh and eighth grade teachers implied that if sixth grade teachers needed supplies or equipment, they could just borrow them. But to the sixth grade teachers borrowing was not an option, and the problems inherent in borrowing were seen as overwhelming.

When asked "Where is science equipment stored in your school?" the responses of the sixth grade teachers were revealing. A typical response was:

> For the most part it is stored in the seventh and eighth grade classrooms. Sixth grade teachers have very little. Anything I have was inherited from the teacher that used to teach in this room. She had petri dishes, kitchen solutions, eye droppers, a Bunsen burner, gloves, a coffee cup, and that's it... I can borrow from the seventh and eighth grade classrooms except that they are often teaching the very same units we are... I went out and bought rubber gloves. Time-wise it's easier for me to just go buy them than to run around and find out who's got them. Several people I don't mind asking (to borrow equipment) and others make you feel like you are bothering them. Because our schedules are all different it is difficult for me to find (them). I don't know all their schedules and when they have planning hours; I am usually here until 4:30 or 5:00 at night and even if I run down after school they might be in the office. It is hard to jump back and forth because you have to get them in their rooms where they can dig it out for you. Or if I leave them a note, I might get (the equipment) three days later than when I need it.

Another sixth grade teacher responded:

> There is a storage room that is accessed by the seventh grade science classrooms and there's one between the two eighth grade science classrooms. Sixth grade science equipment ... I've got a microscope, and I've got a cup with some pennies. We (sixth grade science teachers) don't have any common area. We don't have keys and for those other rooms and to get to them we have to go through classrooms and our planning periods do not line up so we could go in during planning period. The seventh grade room opens up to the hall but none of us has a key for it. And they don't want us to borrow their stuff anyway. They get really uptight.

Another sixth grade teacher stated:

> I know there is a science storage room somewhere here, but I have no earthly idea what's in it. I've never seen it.

It was interesting that several teachers had coped with the lack of equipment and supplies by borrowing and then keeping what they had borrowed. When asked what equipment was needed, one sixth grade teacher responded:

> Microscopes. I stole one at the beginning of the year. I still have it. There was a bioscope that if I had even known we had, I could have used it when I taught cells. I didn't know we had it. Mostly what

> we need are things that they don't have available for sixth grade science, like large plants and Bunsen burners. I have a hot plate that I bought myself. There's probably a hot plate at school, but where it is I don't know. And I don't have access where I could rummage through these storage rooms and pull things out... The test tubes I got from a laboratory. The test tube holder they gave me, but that's not from the schools. I really don't count that. That's literally all I have from the schools. Everything else I had to beg, borrow, or steal from somewhere else.

Another sixth grade teacher with 13 years of experience shared the following:

> One thing I have not been able to get a hold of, and I did get a hold of it from a high school teacher, was universal paper. I cut one piece of universal paper into ten little strips just so I can conserve it. When I run out of litmus paper, I don't know where I would go to buy more. In elementary school we were were given, usually at the end of the year, a $500 budget to replace anything we consumed in our science kits; so I have been fortunate in being able to get these things. But I have none this year; I mean no money has been made known to me... I was basically in charge of everything in the elementary school, so I knew where and how to get supplies, when I got the money, but now I don't have the money.

Sixth grade teachers also tended to be housed in rooms that were not traditionally science laboratories. This meant that they did not have easily accessible water, electrical outlets or lab tables. In an effort to house science teachers with their teams in different "houses," one school converted the science wing, that had been part of the junior high school, to special education classrooms. This conversion meant that the water had been cut off and the access to the science storage closet was blocked. In addition, two of the sixth grade science teachers had to teach in non-science rooms without water. Although these concerns about equipment and supplies may appear to be isolated concerns, initial discussions with science teachers across the country have revealed that ownership and access problems may be the rule rather than the exception.

Science Information and Leadership

In order to fully embrace the interdisciplinary team concept that is associated with the middle school movement, the schools revised the school organization so that team leaders became the leadership component of the school. Departmental chairpersons were no longer funded positions, although schools tended to utilize these individuals as science contact

people. In addition, teachers at the three schools met in daily meetings with their teams and no longer had regular departmental meetings. During the interviews, teachers were asked how information about science-related activities, workshops and meetings was shared within the school. Eight of the teachers indicated that the former department head would receive information from the principal and then pass it on to the teachers. Six of the teachers indicated serious problems in getting information.

This was a particular problem for three of the four sixth grade teachers. One teacher stated:

> We don't get a lot of information. Mr. (Principal) sticks it in whosever box he's by at that time. The science olympiad information came to us about a week or two before the science olympiad...we did go, but it was sort of a joke... It's because we don't have a science chairperson, we get different things going to different people and the word did not get out.

Another teacher at the same school:

> Information received at the school is given to (former department head) because she has seniority as far as she has been here fourteen years... Often she receives materials that she doesn't want so she tosses them out, not realizing that we could use them... There needs to be more communication between the science people.

A sixth grade teacher at another school was asked if she receives information about science related activities and she responded:

> I don't, no. I don't get any information at all... I don't think they consider me. I don't get a lot of this information.

Overall, teachers seemed to feel that there was a need to meet regularly to discuss field trips, science fairs and science olympiads. It appeared that the teachers felt that this would not take away from the concept of teaming and would promote communication.

A seventh grade teacher shared these thoughts:

> I think there is a real weakness in not having a department chair. It's a real problem that the science department is not organized in a unit anymore. I think that will hurt us in many ways, one of which is the flow from year to year in the curriculum. We don't know exactly what the sixth grade is doing and they don't know exactly what we're doing... I'm not sure what skills (sixth graders) are

coming to me with; I'm not sure what equipment they have to work with and what they emphasize.

I think if there were a science department as a unit as we had last year, we had science fair meetings... we'd have a better handle on that and a lot of other things too, like coordinating responsibilities for things like science clubs. The science club suffered a great deal this year; it (used to be) one of our strongest clubs at this school.

In addition to restructuring the school with team leaders instead of department chairs during the move to middle schools, there was restructuring of the central office personnel to include a middle school supervisor and a middle school specialist instead of content area supervisors. The middle school supervisor was responsible for covering all the content areas for the middle schools, in addition to facilitating the organizational changes that took place in the transition from junior highs to middle schools. The middle school specialist spent one day a week in each school working with teachers in different subject areas. This district level leadership change is typical of other school systems that have made the transition to middle schools (George, 1990).

Teachers in the study shared their concerns about the leadership shift at the district level:

It would probably be easier if (the supervisor) was one (middle school) person, but I'm not so sure easier is best... I think it is good to have somebody downtown who is over all. I mean it would be nice to have somebody who is a middle school science person, who helps to coordinate inservice and keeps the county together...the reason I say this is for kids who transfer schools. I have a young lady in a class right now, who probably will not pass her exam simply because she has done the second half of the red book twice. (This) really shouldn't be allowed, that's something that needs to be mandated from above and not within each school.

Another teacher felt the middle school coordinator might not be able to relate to the problems of those teachers who teach science. She said:

The person that is the middle school coordinator does stop in and she'll say, "How are things going?" But I don't think this is her field area. She may understand that there are some difficulties within the science area, so if we say we don't have enough books, she can identify with that, but if i say I don't have enough test tubes, it's like, "What do you need test tubes for?" The general consensus that I have gotten from this school is that science is low rung on the

ladder. The feeling is that the kids can go to science in junior high school, but they don't really need it here (in middle school).

However, not all the science teachers perceived a problem with the lack of science departmentalization. One sixth grade teacher pointed out that she taught language arts, science and health, and that whenever subject area meetings were held, she had to go to all three. However, not all of the teachers in this study taught subjects other than science. Many of the seventh and eighth grade teachers continued to teach science throughout the day, just as they had done under the junior high organization.

Funding for science supplies and equipment was handled differently under the middle school structure. At school A, the former science department head continued to coordinate the purchasing of supplies; however, purchases were now made by teams. When individual teachers communicated a need, she would divide up the equipment requests and ask teachers to request different items through their team budget. Requests from each different subject teacher on the team were compiled, prioritized and then purchased as the budget would allow. This appeared to work well for the seventh and eighth grade teachers, who already had good equipment, but did not appear to be a sufficient system for the sixth grade teachers.

School B handled the funding strictly through the principal and the teams. Science teachers at this school felt they had to compete with the other subject area teachers to make needed purchases.

One sixth grade teacher felt this was a particularly bad system:

> The money is handled a different way this year. Evidently it's put in a big fund and the principal... doles it out to team members. I was given a budget of $150 for our science equipment which obviously doesn't buy much. Most of our money went towards paper because our team leader likes to run things off on paper, construction paper, and colored pencils, all these things took priority over science...

> There was a $50 fund given to teachers. But $50 got used up a long time ago just getting markers and things like that which we needed for holidays. So there's not a lot of equipment and a lot of what I do comes right out of my pocket. And that really limits what the kids get.

The third school designated a science budget and coordinated science purchase requests through the curriculum coordinator and the media coordinator. It appeared that this system worked satisfactorily.

Discussion

A recurring theme that emerged from the data is the unique situation of the sixth grade science teacher. Seventh and eighth grade teachers in the study did not perceive sixth grade science teaching as "equivalent" to their own. There was an implication that sixth grade teachers did not need equipment or supplies.. Sixth grade teachers were also more likely to be housed in classrooms without laboratory facilities. The lack of access to science equipment and laboratory facilities left the sixth grade teachers in the study with a feeling of low status in the school. Even though the sixth grade teachers now housed in middle schools had equivalent equipment and supplies as when they were housed in elementary schools, when compared to the seventh and eighth grade teachers, there was a distinct deficit.

Typically when schools convert from junior high schools to middle schools, the seventh and eighth grade teachers are housed in their previous buildings and often in their same classrooms while the sixth and ninth grade students and teachers move to different buildings. A sixth grade teacher with 25 years of experience from a different school system shared an account of her situation. She was moved from an elementary school where she had taught for many years to a middle school. She was not given a classroom, due to overcrowding and was asked to travel from one class to another using a cart to carry her materials. She became the "new kid on the block," whereas at the elementary school she had previously enjoyed the seniority status and benefits of her many years of experience.

The differences in certification and teacher preparation contribute to the low status perception of the sixth grade science teacher. The seventh and eighth grade teachers, many with degrees in biology, physics or chemistry, have little understanding of the background, talents or curricula taught by the sixth grade teachers. Many middle school leaders believe that the sixth grade teachers make the best middle school teachers due to their wide background, their flexibility and their focus on teaching the "whole child" (George, 1989) with a "student-centered" approach (McPartland, 1990). The specialization brought to the school by the seventh and eighth grade teachers can be invaluable in providing high quality, subject-specific instruction. However, the student-centered orientation of sixth grade teachers can provide early adolescents with the close relationships, guidance and support that are often critical during this period of extreme physical and emotional change. The data from this study suggest that additional science inservice training may be needed for the sixth grade teachers, since they now specialize in one or two content areas. On the other hand, the seventh and eighth grade teachers may need additional inservice education on interdisciplinary instruction and child development.

It was quite apparent that good middle school science teaching and the middle school concept can be compatible. In this school system, science

instruction was enhanced under the new organizational structure. Teachers had more instructional time and very promising efforts were being made to make science interdisciplinary. These initial attempts at interdisciplinary instruction may enhance future curricular changes such as those being proposed as part of the National Science Teachers Scope and Sequence curriculum.

Overall, teachers were supportive and enthusiastic about middle school organization. However, the leadership issues need to be reconsidered. The interdisciplinary teams appeared to be effective in getting different content area teachers to work together, but the teams were unable to meet the specialized functions of a science department. There was a strong consensus that teachers needed to continue to meet occasionally by department to discuss science fairs, science clubs and other issues such as equipment inventory. There was a distinct need for leadership to coordinate science instruction at the school level. Someone needed to be the science "contact person" to see that information was distributed and that equipment and supplies were in some way coordinated. In addition, this individual needs administrative support from the principal to empower them to make changes and provide leadership. There was a clear need for the seventh and eighth grade teachers to discuss curricular issues with the sixth grade teachers. In addition, teachers perceived a need for a science supervisor at the county office level. They felt that this person should be in addition to, not instead of the middle school coordinator. Teachers did not appear to understand who to talk with about requests for inservice or travel funds. The potential use of a K-12 science coordinator appeared to be a very workable system.

The control of funding had potential to become a problem in future years. Although the schools were very well equipped in general, the teachers perceived a problem in competing with other content areas for funds. Without science leadership and coordination, it seemed conceivable that large expenditures for equipment such as microscopes could be overlooked.

In all three schools there were equipment ownership problems. Teachers who had accumulated supplies over the years were apparently successful at shielding these items from use by other teachers. This created dichotomous groups of teachers: those very equipment "rich" and those very "poor." Effective science leadership was needed to recover equipment, house it in areas accessible to all science teachers and develop an equitable checkout system. This step seems crucial for excellence in the total science program.

Further research is needed to determine whether the conditions and situations described in this case study are typical of other school systems and other middle schools. Additional data is needed to determine how long transitional problems persist and the long term impact of leadership

changes on the instructional program. The pervasive concerns identified in this study should be addressed by any school system undergoing transition from junior highs to a middle schools.

TABLE I
Pre- and Inservice Education

Grade Level Taught	Years Teaching Experience (X)	Science Courses Completed (X)	Graduate Degree	Inservice Workshops Completed (X)
Sixth (N=4)	6.75	7.75	0	2.25
Seventh (N=5)	8.10	18.80	2	0.40
Eighth (N=5)	7.20	8.00	1	0.40

TABLE II
Teacher Certification

Certification Grade Levels	Grade Level Taught		
	Sixth	Seventh	Eighth
K - 8			1
K - 9	1		
4 - 6	1		
4 - 9	2		
6 - 8			1
6 - 9		1	1
6 -12		1	
7 - 9			1
7 -12		2	
9 -12			1

TABLE III
Interdisciplinary Units
Taught by Teams

Flight
Pollution
Trash
Mythology and Space
Egypt
Water, Water Everywhere
The Olympics
Mystery
The Zoo
Conservation

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